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First Named Inventor	Kinsman et al.
Art Unit	2822
Examiner Name	D. Graybill
Attorney Docket Number	2269-3056.1US (96-0803.01/US)

ENCLOSURES ***(check all that apply)***

- ☐ Fee Transmittal Form
  - ☐ Fee Attached
- ☐ Amendment / Reply
  - ☐ After Final
  - ☐ Affidavits/declaration(s)
- ☐ Extension of Time Request
- ☐ Express Abandonment Request
- ☐ Information Disclosure Statement
- ☐ Certified Copy of Priority Document(s)
- ☐ Reply to Missing Parts/ Incomplete Application
  - ☐ Reply to Missing Parts under 37 CFR1.52 or 1.53
- ☐ Drawing(s)
- ☐ Licensing-related Papers
- ☐ Petition
- ☐ Petition to Convert to a Provisional Application
- ☐ Power of Attorney, Revocation Change of Correspondence Address
- ☐ Terminal Disclaimer
- ☐ Request for Refund
- ☐ CD, Number of CD(s) ____
  - ☐ Landscape Table on CD
- ☐ After Allowance Communication to TC
- ☐ Appeal Communication to Board of Appeals and Interferences
- ☒ *Corrected* Brief on Appeal filed in Response to Notification of Non-Compliant Appeal Brief dated September 27, 2006
- ☐ Proprietary Information
- ☐ Status Letter
- ☐ Other Enclosure(s) *(please identify below)*:

Remarks

The Commissioner is authorized to charge any additional fees required but not submitted with any document or request requiring fee payment under 37 C.F.R. §§ 1.16 and 1.17 to Deposit Account 20-1469 during pendency of this application.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT

Firm	TraskBritt, P.C.		
Signature	James R. Duzan		
Printed Name	James R. Duzan		
Date	October 24, 2006	Reg. No.	28,393

CERTIFICATE OF MAILING

Express Mail Label Number: EV827470013US

Date of Deposit: October 24, 2006

Person Making Deposit: Brett Hooke

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

Kinsman et al.

Serial No.: 09/538,684

Filed: March 30, 2000

For: VARIED-THICKNESS HEAT SINK FOR INTEGRATED CIRCUIT (IC) PACKAGE (as amended)

Confirmation No.: 8722

Examiner: D. Graybill

Group Art Unit: 2822

Attorney Docket No.: 2269-3056.1US (96-0803.01/US)

NOTICE OF EXPRESS MAILING

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CORRECTED BRIEF ON APPEAL FILED IN RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This *Corrected* Brief on Appeal is filed in response to the Notification of Non-Complaint Appeal Brief mailed September 27, 2006, the one-month period for reply to which expires on October 27, 2006.

This brief is submitted as a single copy pursuant to 37 C.F.R. § 41.37 and in the format required by 37 C.F.R. § 41.37(c) (1).

1) REAL PARTY IN INTEREST

The real party in interest is Micron Technology, Inc., a corporation of the State of Delaware, having a place of business at 8000 South Federal Way, Boise, Idaho 83707-006, Reel/Frame 8632/0612.

2) RELATED APPEALS AND INTERFERENCES

Neither Appellants, the Appellants' representative, nor the Assignee is aware of any pending appeal or interference which would directly affect, be directly affected by, or have any bearing on the Board's decision in the present pending appeal.

3) STATUS OF THE CLAIMS

Claims 7, 21, 23 and 32 were withdrawn and are not the subject of this appeal.

Claims 5, 13, 30 and 38 were previously canceled.

Claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 stand rejected.

No claims are allowed

The rejection of claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 is being appealed.

4) STATUS OF AMENDMENTS

No proposed amendments were submitted after the current final rejection.

5) SUMMARY OF THE CLAIMED SUBJECT MATTER

The present invention includes an integrated circuit (IC) package 10 having a plurality of leads 16, 46, 76 and a heat sink 28, 58, 88. The plurality of leads 16, 46, 76 has a reduced lead inductance. (Specification, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12). The IC package 10, 40, 70 includes a package body 12, 42, 72, an integrated circuit die 14, 44, 74 positioned within the package body 12, 42, 72 a lead frame 18, 48, 78 and an electrically conductive heat sink 28, 58, 88. The lead frame 18 may include a plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 that connect to the integrated circuit die 14, 44, 74. The plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 form an area. The electrically conductive heat sink 28, 58, 88 may be positioned at least partially within the package body 12, 42, 72. A surface of a first portion 26, 56, 86 of the heat sink 28, 58, 88 may face the lead frame 18, 48, 78 in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area (Specification, page 5, lines 10-14, page 10, lines 19-24, pate 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 having portions enclosed within the package body 12, 42, 72. A die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 28, 58, 88 may be attached to the integrated circuit die 14, 44, 74. A second portion 30, 60, 90 of the heat sink 28, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 may project away from the first portion 26, 56, 86 of the heat sink 28, 58, 88. (Specification, page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

The heat sink 28, 58, 88 may be directly coupled to one of a signal voltage and a reference voltage. (*Id.*, page 10, line 25- page 11, line 2). The heat sink 28, 58, 88 may operate respectively as a signal plane and a ground plane (Specification, page 5, lines 14-16, page 11, lines 2-8, page 13, lines 4-8, pate 14, lines 20-22) for the plurality of leads 16, 46, 76 of the lead frame reducing lead inductance of the plurality of leads 16, 46, 76 of the lead frame at least about 0.90 nanoheneries. (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

In one embodiment, the electrically conductive heat sink 28, 58, 88 may be positioned at least partially within the package body 12, 42, 72 and may include a vertically extending

columnar portion surrounded by a horizontally extending skirt portion having a vertical thickness. (FIGs. 1A, 1B, 1C). The columnar portion may include a vertical thickness which is greater than the vertical thickness of the skirt portion and may include a lead frame attachment surface proximate a die-attach surface substantially vertically aligned with the columnar portion. (*Id.*). The lead frame attachment surface may be attached to the lead frame 18, 48, 78 and extending in close proximity to a substantial part of the enclosed portions of at least eighty percent of the area (*Id.*, page 5, lines 10-14, page 10, lines 19-24, pate 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame having portions enclosed within the package body 12, 42, 72, the die-attach surface being attached to the integrated circuit die 14, 44, 74 reducing lead inductance of the plurality of leads 16, 46, 76 of the lead frame at least about 0.90 nanoheneries . (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16) .

The present invention also includes an integrated circuit (IC) package 10, 40, 70 having a plurality of leads 16, 46, 76 and a heat sink 28, 58, 88. The plurality of leads 16, 46, 76 has a reduced lead inductance. (*Id.*, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12). The IC package 10, 40, 70 includes an integrated circuit die 14, 44, 74, a lead frame 18 and an electrically conductive heat sink 28, 58, 88. The lead frame 18, 48, 78 may include a plurality of leads 16, 46, 76 which form an area. The electrically conductive heat sink 28, 58, 88 may include a surface of a first portion 26, 56, 86 facing the lead frame 18, 48, 78 in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area (*Id.*, page 5, lines 10-14, page 10, lines 19-24, page 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78. A die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 28, 58, 88 may be attached to the integrated circuit die 14, 44, 74. A second portion 30, 60, 90 of the heat sink 28, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 may project away from the first portion 26, 56, 86 of the heat sink 28, 58, 88. (*Id.* page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

The heat sink 28, 58, 88 may be directly coupled to one of a signal voltage and a reference voltage. (*Id.*, page 10, line 25- page 11, line 2). The heat sink 28, 58, 88 may operate

respectively as a signal plane and a ground plane plane (*Id.*, page 5, lines 14-16, page 11, lines 2-8, page 13, lines 4-8, page 14, lines 20-22) for the plurality of leads 16, 46, 76 of the lead frame reducing lead inductance of the plurality of leads 16, 46, 76 of the lead frame at least about 0.90 nanoheneries. (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

The present invention also includes electronic system having an input device 102, an output device 104, a memory device 108, and a processor device 106 coupled to the input device 102, output device 104, and memory device 108. At least one of the input device 102, output device 104, memory device 108, and processor device 106 may include an integrated circuit package 10, 40, 70 having a plurality of leads 16, 46, 76 and a heat sink 28, 58, 88. The plurality of leads 16, 46, 76 may have reduced lead inductance. (*Id.*, page 14, lines 23-28).

The electronic system includes a package body 12, 42, 72, an integrated circuit die 14, 44, 74 positioned within the package body 12, 42, 72, a lead frame 18 and an electrically conductive heat sink 28, 58, 88. The lead frame 18, 48, 78 may include a plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 that connect to the integrated circuit die 14, 44, 74. The plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 form an area. The electrically conductive heat sink 28, 58, 88 may be positioned at least partially within the package body 12, 42, 72. A surface of a first portion 26, 56, 86 of the heat sink 28, 58, 88 may face the lead frame 18, 48, 78 in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 having portions enclosed within the package body 12, 42, 72. A die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 28, 58, 88 may be attached to the integrated circuit die 14, 44, 74. A second portion 30, 60, 90 of the heat sink 28, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 may project away from the first portion 26, 56, 86 of the heat sink 28, 58, 88. The integrated circuit die 14, 44, 74 reducing lead inductance of the plurality of leads 16, 46, 76, of the lead frame at least about 0.90 nanoheneries. (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

To comply with the provisions of 37 CFR § 1.41.37 to provide a summary and map of the claimed subject mater of each independent claim being appealed identified by the appropriate

line and page of the specification as well as drawing figure, referring to drawing Figs. 1A, 1B, and 1C and referring to independent claim 1, the present invention is directed to [a]n integrated circuit (IC) package 10 having a plurality of leads 16, 46, 76 and a heat sink 28, 58,88, the plurality of leads 16, 46, 76 having reduced lead inductance (Specification, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12) comprising:

a package body 12, 42, 72;

an integrated circuit die 14, 44, 74 positioned within the package body 12, 42, 72;

a lead frame 18, 48, 78 including a plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 that connect to the integrated circuit die 14, 44, 74, the plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 forming an area; and

an electrically conductive heat sink 28, 58, 88 positioned at least partially within the package body 12, 42, 72 with a surface of a first portion 26, 56, 86 of the heat sink 28, 58, 88 facing the lead frame 18, 48, 78 in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area (Specification, page 10, lines 19-24, page 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 having portions enclosed within the package body 12, 42, 72 and with a die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 28, 58, 86 attached to the integrated circuit die 14, 44, 74, a second portion 30, 60, 90 of the heat sink 28, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 projecting away from the first portion 26, 56, 86 of the heat sink 28, 58, 88, the heat sink 28, 58, 88 directly coupled to one of a signal voltage and a reference voltage (*Id.*, page 10, line 25-page 11, line 2), the heat sink operating respectively as a signal plane and a ground plane (*Id.*, page 5, lines 14-16, page 11, lines 2-8, page 13, lines 4-8, page 14, lines 20-22) for the plurality of leads 16, 46, 76 of the lead frame 18 reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries . (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

Referring to drawing Figs. 1A, 1B, 1C, and Fig.2 and referring to independent claim 22, the present invention is directed to [a]n electronic system having an input device 102, an output

device 104, a memory device 108, and a processor device 106 coupled to the input, output, and memory devices 102, 104, 108, at least one of the input, output, memory, and processor devices 102, 104, 108, 106 including an integrated circuit package 10, 40, 70 having a plurality of leads 16, 46, 76 and a heat sink 28, 58, 88, the plurality of leads having reduced lead inductance (Specification, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12) comprising:

a package body 12, 42, 72;

an integrated circuit die 14, 44, 74 positioned within the package body 12, 42, 72;

a lead frame 18, 48, 78 including a plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 that connect to the integrated circuit die 14, 44, 74, the plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 forming an area; and

an electrically conductive heat sink 18, 58, 88 positioned at least partially within the package body 12, 42, 72 with a surface of a first portion 26, 56, 86 of the heat sink 18, 58, 88 facing the lead frame 18, 48, 78 in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area (*Id.*, page 10, lines 19-24, page 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 having portions enclosed within the package body 12, 42, 72 forming an area and having a die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 18, 58, 88 attached to the integrated circuit die 14, 44, 74, a second portion 30, 60, 90 of the heat sink 18, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 projecting away from the first portion 26, 56, 86 of the heat sink 18, 58, 88 and the integrated circuit die 14, 44, 74 reducing lead inductance of the plurality of leads 16, 46, 76 of the lead frame 18, 48, 88 at least about 0.90 nanoheneries . (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

Referring to drawing Figs. 1A, 1B, and 1C and referring to independent claim 24, the present invention is directed to [a]n integrated circuit package 10, 40, 70 having a plurality of leads 16, 46, 76 and a heat sink 28, 58, 88, the plurality of leads 16, 46, 76 having a reduced lead inductance (Specification, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12) comprising:

a package body 12, 42, 72;

an integrated circuit die 14, 44, 74 positioned within the package body 12, 42, 72;

a lead frame 18, 48, 78 including a plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 that connect to the integrated circuit die 14, 44, 74, the plurality of leads 16, 46, 76 having portions enclosed within the package body 12, 42, 72 forming an area; and

an electrically conductive heat sink 28, 58, 88 positioned at least partially within the package body 12, 42, 72 with a vertically extending columnar portion 86 surrounded by a horizontally extending skirt portion 90 having a vertical thickness, said columnar portion 86 having a vertical thickness which is greater than the vertical thickness of said skirt portion 90, and having a lead frame attachment surface proximate a die-attach surface substantially vertically aligned with the columnar portion 86, the lead frame attachment surface being attached to the lead frame 18, 48, 78 and extending in close proximity to a substantial part of the enclosed portions of at least eighty percent of the area formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 (*Id.,* page 10, lines 19-24, page 12, lines 23-28, page 14, lines 11-16) having portions enclosed within the package body 12, 42, 72, the die-attach surface being attached to the integrated circuit die 14, 44, 74 reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries nanoheneries . (*Id.,* page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18- page 13, line 22; page 14, lines 6-16).

Referring to drawing Figs. 1A, 1B, and 1C and referring to independent claim 25, the present invention is directed to [a]n integrated circuit package 10, 40, 70 having heat sink 28, 58, 88 and a plurality of leads 16, 46, 76 having a reduced lead inductance inductance inductance (Specification, page 5, lines 10-14, page 6, lines 18-21, page 11, lines 9-12) comprising:

an integrated circuit die 14, 44, 74;

a lead frame 18, 48, 78 including a plurality of leads 16, 46, 76 having portions that are connected to the integrated circuit die 14, 44, 74, the plurality of leads 16, 46, 76 forming an area; and

an electrically conductive heat sink 28, 58, 88 positioned having a surface of a first portion of the heat sink 28, 58, 88 facing the lead frame 18, 48, 78 in close proximity to a substantial part of an enclosed portion of at least eighty percent of the area 78 (*Id.*, page 10, lines 19-24, page 12, lines 23-28, page 14, lines 11-16) formed by the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 and with a die-attach area on the surface of the first portion 26, 56, 86 of the heat sink 28, 58, 88 attached to the integrated circuit die 14, 44, 74, a second portion 30, 60, 90 of the heat sink 28, 58, 88 under the die-attach area and the integrated circuit die 14, 44, 74 projecting away from the first portion 26, 56, 86 of the heat sink 28, 58, 88, the heat sink 28, 58, 88 coupled to one of a signal voltage and a reference voltage (*Id.*, page 10, line 25-page 11, line 2) for the heat sink 28, 58, 88 to operate respectively as a signal plane and a ground plane (*Id.*, page 5, lines 14-16, page 11, lines 2-8, page 13, lines 4-8, page 14, lines 20-22) for the plurality of leads 16, 46, 76 of the lead frame 18, 48, 78 reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries . (*Id.*, page 14, lines 24-28; page 8, line 2- page 9, line 6; page 10, lines 14-24; page 11, lines 19-24; page 12, lines 1-6, page 12, line 18-page 13, line 22; page 14, lines 6-16).

6) GROUNDS OF REJECTION TO BE REVIEWED

A. Whether claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 are unpatentable under 35 U.S.C. § 101 as being non-statutory because they improperly embrace or overlap two different statutory classes.

B. Whether claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 are unpatentable under 35 U.S.C. §112, second paragraph, as being directed to both a device and a process of using the device.

7) ARGUMENT

(i) 35 U.S.C. § 101

Claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 stand rejected under 35 U.S.C. § 101 as allegedly being non-statutory for improperly embracing or overlapping two different statutory classes.

a. Claim 1-4, 6, 8-12, and 14-20

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §101. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 1, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, the structural relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes

functional claim language. Accordingly, the rejection of independent claim 1, and dependent claims 2-4, 6, 8-12, and 14-20 therefrom, should be reversed.

The Examiner also asserts that the claim language "the heat sink coupled to one of a signal voltage and a reference voltage, the heat sink operating respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. The rejected claim language describes functional limitations of the heat sink and also defines the structural relationship between the heat sink and the leads of the claimed integrated circuit package.

Specifically, the claim element "the heat sink coupled to one of a signal voltage and a reference voltage" is clearly appropriate in an apparatus claim. The claim element "the heat sink operating respectively as a signal plane and a ground plane for the plurality of leads of the lead frame" describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. Further, as described herein, the claim element of "reducing lead inductance of the plurality of leads of the lead frame" also describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 1, and dependent claims 2-4, 6, 8-12, and 14-20 therefrom, should be reversed.

b. Claim 22

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §101. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of

an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 22, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 22 should be reversed.

The Examiner also asserts that the claim language "the heat sink and the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. The rejected claim language describes functional limitations of the heat sink and integrated circuit die and also defines the structural relationship between the heat sink, integrated circuit die and the leads of the claimed integrated circuit package. As stated, as explained in the specification, this relationship between the heat sink, integrated circuit die and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 22 should be reversed.

c. Claim 24

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §101. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently-claimed invention. As recited in claim 24, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of

the leads relative to other claimed elements within the claimed electronic system. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 24 should be reversed.

The Examiner also asserts that the claim language "the die attached surface being attached to the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. When the claim language is viewed in its entirety, it is clear the rejected claim language describes functional limitations of the heat sink and integrated circuit die and also defines the structural relationship between the heat sink, integrated circuit die and the leads of the claimed integrated circuit package. As stated, as explained in the specification, this relationship between the heat sink, integrated circuit die and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed electronic system. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 24 should be reversed.

d. Claims 25-29, 31, 33-37 and 39-45

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §101. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 25, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 25, and dependent claims 26-29, 31, 33-37 and 39-45 therefrom, should be reversed.

The Examiner also asserts that the claim language "the heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. The rejected claim language describes functional limitations of the heat sink and also defines the structural relationship between the heat sink and the leads of the claimed integrated circuit package.

Specifically, the claim element "the heat sink coupled to one of a signal voltage and a reference voltage" is clearly appropriate in an apparatus claim. The claim element "for the heat sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame" describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. Further, as described herein, the claim element of "reducing lead inductance of the plurality of leads of the lead frame" also describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §101 precludes functional claim language. Accordingly, the rejection of independent claim 25, and dependent claims 26-29, 31, 33-37 and 39-45 therefrom, should be reversed.

(ii) 35 U.S.C. § 112, second paragraph, indefiniteness

Claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 stand rejected under 35 U.S.C. §112, second paragraph, as allegedly being directed to both a device and a process of using the device.

a. Claim 1-4, 6, 8-12, and 14-20

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the claimed device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §112, second paragraph. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 1, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, the structural relationship between the electrically conductive heat sink and the plurality of leads that

"substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph precludes functional claim language. Accordingly, the rejection of independent claim 1, and dependent claims 2-4, 6, 8-12, and 14-20 therefrom, should be reversed.

The Examiner also asserts that the claim language "the heat sink coupled to one of a signal voltage and a reference voltage, the heat sink operating respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. "A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step." MPEP § 2173.05(g) In the current case, the rejected claim language describes functional limitations of the heat sink and also defines the structural relationship between the heat sink and the leads of the claimed integrated circuit package.

Specifically, the claim element "the heat sink coupled to one of a signal voltage and a reference voltage" is clearly appropriate in an apparatus claim. The claim element "the heat sink operating respectively as a signal plane and a ground plane for the plurality of leads of the lead frame" describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. Similar claim language has been approved by the Federal Circuit. In *Innova/Pure Water Inc. v. Safari Water Filtration Sys. Inc.*, 381 F.3d 1111, 1117-20, 72 USPQ2d 1001, 1006-08 (Fed. Cir. 2004), the court noted that the claim term "operatively connected" is "a general descriptive claim term frequently used in patent drafting to reflect a functional relationship between claimed components," that is, the term "means the claimed components must be connected in a way to perform a designated function." *Id.* at 1118, 72 USPQ2d at 1006. In the current case, the claim language "operating respectively" also defines the relationship between the heat sink and the plurality of leads so that the heat sink may function as a signal plane and ground plane for the plurality of leads.

Further, as described herein, the claim element of "reducing lead inductance of the plurality of leads of the lead frame" also describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. The presently claimed invention includes "present structural limitations on each part, which structural limitations are defined by how the parts are to be interconnected in the final [product]." *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976). Accordingly, claim 1 complies with 35 U.S.C. §112, second paragraph.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph precludes functional claim language. Accordingly, the rejection of independent claim 1, and dependent claims 2-4, 6, 8-12, and 14-20 therefrom, should be reversed.

b. Claim 22

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §112, second paragraph. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 22, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion

of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 22 should be reversed.

The Examiner also asserts that the claim language "the heat sink and the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. "A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step." MPEP § 2173.05(g). The rejected claim language describes functional limitations of the heat sink and integrated circuit die and also defines the structural relationship between the heat sink, integrated circuit die and the leads of the claimed integrated circuit package. As stated, as explained in the specification, this relationship between the heat sink, integrated circuit die and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2). The presently claimed invention includes "present structural limitations on each part, which structural limitations are defined by how the parts are to be interconnected in the final [product]." *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976). Accordingly, claim 22 complies with 35 U.S.C. §112, second paragraph.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second

paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 22 should be reversed.

c. Claim 24

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §112, second paragraph. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself, render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 24, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed electronic system. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 24 should be reversed.

The Examiner also asserts that the claim language "the die attached surface being attached to the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. "A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step." MPEP § 2173.05(g). When the claim language is viewed in its entirety, it is clear the rejected claim language describes functional limitations of the heat sink and integrated circuit die and also defines the structural relationship between the heat sink, integrated circuit die and the leads of the claimed integrated circuit package. As stated, as explained in the specification, this relationship between the heat sink, integrated circuit die and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2). The presently claimed invention includes "present structural limitations on each part, which structural limitations are defined by how the parts are to be interconnected in the final [product]." *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976). Accordingly, claim 24 complies with 35 U.S.C. §112, second paragraph.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed electronic system. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 24 should be reversed.

d. Claims 25-29, 31, 33-37 and 39-45

The limitation "leads having a reduced lead inductance" was rejected as allegedly being a process of using the device. Appellants respectfully disagree and submit that the rejected claim language is a functional limitation of the claimed device. Inclusion of functional limitations in an apparatus claim is not contrary to 35 U.S.C. §112, second paragraph. "A functional limitation is an attempt to define something by what it does, rather than by what it is (e.g., as evidenced by its specific structure or specific ingredients). There is nothing inherently wrong with defining some part of an invention in functional terms. Functional language does not, in and of itself,

render a claim improper." MPEP §2173.05(g) citing *In re Swinehart*, 439 F.2d 210, 169 USPQ 226 (CCPA 1971); *See also,* MPEP §2114 (discussing functional claim language in apparatus claims and prior art analysis).

In the current case, the rejected language describes a function or property of the leads and further defines the structural relationship between the leads and the electrically conductive heat sink of the presently claimed invention. As recited in claim 25, "an electrically conductive heat sink [is] positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body." As explained in the specification, this relationship between the electrically conductive heat sink and the plurality of leads that "substantially reduce[s] an inductance associated with each of the leads." (Specification, page 6, lines 10-14; page 11, line 18 – page 12, line 2).

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 25, and dependent claims 26-29, 31, 33-37 and 39-45 therefrom, should be reversed.

The Examiner also asserts that the claim language "the heat sink coupled to one of a signal voltage and a reference-voltage for the heat sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame" is a process of using the device. Appellants respectfully disagree. "A functional limitation is often used in association with an element, ingredient, or step of a process to define a particular capability or purpose that is served by the recited element, ingredient or step." MPEP § 2173.05(g). The rejected claim language describes functional limitations of the heat sink and also defines the structural relationship between the heat sink and the leads of the claimed integrated circuit package.

Specifically, the claim element "the heat sink coupled to one of a signal voltage and a reference voltage" is clearly appropriate in an apparatus claim. The claim element "for the heat

sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame" describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. Similar claim language has been approved by the Federal Circuit. In *Innova/Pure Water Inc. v. Safari Water Filtration Sys. Inc.*, 381 F.3d 1111, 1117-20, 72 USPQ2d 1001, 1006-08 (Fed. Cir. 2004), the court noted that the claim term "operatively connected" is "a general descriptive claim term frequently used in patent drafting to reflect a functional relationship between claimed components," that is, the term "means the claimed components must be connected in a way to perform a designated function." *Id.* at 1118, 72 USPQ2d at 1006. In the current case, the claim language "to operate respectively" also defines the relationship between the heat sink and the plurality of leads so that the heat sink may function as a signal plane and ground plane for the plurality of leads.

Further, as described herein, the claim element of "reducing lead inductance of the plurality of leads of the lead frame" also describes a function of the heat sink as well as the structural relationship between the heat sink and the plurality of leads. The presently claimed invention includes "present structural limitations on each part, which structural limitations are defined by how the parts are to be interconnected in the final [product]." *In re Venezia*, 530 F.2d 956, 189 USPQ 149 (CCPA 1976). Accordingly, claim 25 complies with 35 U.S.C. §112, second paragraph.

The rejected language does not define a process of using the device, rather the language imparts functional limitations on the leads as well as a structural limitation of the placement of the leads relative to other claimed elements within the claimed integrated circuit package. The Examiner has failed to cite any authority to support the assertion that 35 U.S.C. §112, second paragraph, precludes functional claim language. Accordingly, the rejection of independent claim 25, and dependent claims 26-29, 31, 33-37 and 39-45 therefrom, should be reversed.

8) CLAIMS APPENDIX

A copy of claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 is appended hereto as Appendix A.

9) EVIDENCE APPENDIX

There is no evidence appendix.

10) RELATED APPEALS APPENDIX

There is no related appeals appendix.

CONCLUSION

Appellant respectfully submits that claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 are allowable. Appellant respectfully requests that the rejection of claims 1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45 under 35 U.S.C. §101 and 35 U.S.C. § 112, second paragraph, be reversed.

Respectfully submitted,

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APPENDIX A

Claims Appendix

Claims **1-4, 6, 8-12, 14-20, 22, 24-29, 31, 33-37 and 39-45**

U.S. Patent Application No. 09/538,684

Filed March 30, 2000

1. An integrated circuit package having a plurality of leads and a heat sink, the plurality of leads having reduced lead inductance comprising:

a package body;

an integrated circuit die positioned within the package body;

a lead frame including a plurality of leads having portions enclosed within the package body that connect to the integrated circuit die, the plurality of leads having portions enclosed within the package body forming an area; and

an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink directly coupled to one of a signal voltage and a reference voltage, the heat sink operating respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries.

2. The integrated circuit package of claim 1, wherein the package body includes one of a transfer molded plastic package body and a preformed ceramic package body.

3. The integrated circuit package of claim 1, wherein the integrated circuit die includes one of a Dynamic Random Access Memory integrated circuit die, a Static Random Access Memory integrated circuit die, a Synchronous Dynamic Random Access Memory integrated circuit die, a Sequential Graphics Random Access Memory integrated circuit die, a flash Electrically Erasable Programmable Read-Only Memory integrated circuit die, and a processor integrated circuit die.

4. The integrated circuit package of claim 1, wherein the lead frame includes one of a peripheral-lead finger lead frame, a Leads Over Chip lead frame, and a Leads Under Chip lead frame.

6. The integrated circuit package of claim 1, wherein the heat sink is coupled to the reference voltage through one of a wirebond, a conductive adhesive, and a welded connection.

8. The integrated circuit package of claim 1, wherein the heat sink is positioned only partially within the package body.

9. The integrated circuit package of claim 1, wherein the heat sink is coupled to a printed circuit board outside the package body thereby coupled to one of a signal voltage and a reference voltage.

10. The integrated circuit package of claim 8, wherein the second portion of the heat sink projects substantially to one of a top and a bottom of the package body.

11. The integrated circuit package of claim 1, wherein the heat sink is positioned within the package body with the surface of its first portion in close proximity to substantially all of the enclosed portion of each of the plurality of leads of the lead frame.

12. The integrated circuit package of claim 1, wherein the heat sink is positioned within the package body with its first portion extending substantially to at least one side of the package body.

14. The integrated circuit package of claim 1, wherein the first and second portions of the heat sink are integral with one another.

15. The integrated circuit package of claim 1, wherein the first and second portions of the heat sink comprise separate parts.

16. The integrated circuit package of claim 1, wherein the heat sink comprises a plurality of parts, each forming a portion of both the first and second portions of the heat sink.

17. The integrated circuit package of claim 1, wherein the surface of the first portion of the heat sink includes a recess in which the die-attach area is located.

18. The integrated circuit package of claim 1, wherein the heat sink has locking holes therein for locking the heat sink in the integrated circuit package.

19. The integrated circuit package of claim 1, further comprising an adhesive attaching the lead frame to the heat sink.

20. The integrated circuit package of claim 1, wherein the integrated circuit package comprises one of a Vertical Surface Mount Package, a Small Outline J-lead package, a Thin Small Outline Package, a Quad Flat Pack, and a Thin Quad Flat Package.

22. An electronic system having an input device, an output device, a memory device, and a processor device coupled to the input, output, and memory devices, at least one of the input, output, memory, and processor devices including an integrated circuit package having a plurality of leads and a heat sink, the plurality of leads having reduced lead inductance comprising:

a package body;

an integrated circuit die positioned within the package body;

a lead frame including a plurality of leads having portions enclosed within the package body that connect to the integrated circuit die, the plurality of leads having portions enclosed within the package body forming an area; and

an electrically conductive heat sink positioned at least partially within the package body with a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of the enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body forming an area and having a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink and the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries.

24. An integrated circuit package having a plurality of leads and a heat sink, the plurality of leads having a reduced lead inductance comprising:

a package body;

an integrated circuit die positioned within the package body;

a lead frame including a plurality of leads having portions enclosed within the package body that connect to the integrated circuit die, the plurality of leads having portions enclosed within the package body forming an area; and

an electrically conductive heat sink positioned at least partially within the package body with a vertically extending columnar portion surrounded by a horizontally extending skirt portion having a vertical thickness, said columnar portion having a vertical thickness which is greater than the vertical thickness of said skirt portion, and having a lead frame attachment surface proximate a die-attach surface substantially vertically aligned with the

columnar portion, the lead frame attachment surface being attached to the lead frame and extending in close proximity to a substantial part of the enclosed portions of at least eighty percent of the area formed by the plurality of leads of the lead frame having portions enclosed within the package body, the die-attach surface being attached to the integrated circuit die reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries.

25. An integrated circuit package having heat sink and a plurality of leads having a reduced lead inductance comprising:

an integrated circuit die;

a lead frame including a plurality of leads having portions that are connected to the integrated circuit die, the plurality of leads forming an area; and

an electrically conductive heat sink positioned having a surface of a first portion of the heat sink facing the lead frame in close proximity to a substantial part of an enclosed portion of at least eighty percent of the area formed by the plurality of leads of the lead frame and with a die-attach area on the surface of the first portion of the heat sink attached to the integrated circuit die, a second portion of the heat sink under the die-attach area and the integrated circuit die projecting away from the first portion of the heat sink, the heat sink coupled to one of a signal voltage and a reference voltage for the heat sink to operate respectively as a signal plane and a ground plane for the plurality of leads of the lead frame reducing lead inductance of the plurality of leads of the lead frame at least about 0.90 nanoheneries.

26. The integrated circuit package of claim 25, further comprising a package body.

27. The integrated circuit package of claim 26, wherein the package body includes one of a transfer molded plastic package body and a preformed ceramic package body.

28. The integrated circuit package of claim 25, wherein the integrated circuit die includes one of a Dynamic Random Access Memory integrated circuit die, a Static Random Access Memory integrated circuit die, a Synchronous Dynamic Random Access Memory integrated circuit die, a Sequential Graphics Random Access Memory integrated circuit die, a flash Electrically Erasable Programmable Read-Only Memory integrated circuit die, and a processor integrated circuit die.

29. The integrated circuit package of claim 25, wherein the lead frame includes one of a peripheral lead finger lead frame, a Leads-Over-Chip lead frame, and a Leads-Under Chip lead frame.

31. The integrated circuit package of claim 25, wherein the heat sink is coupled to the reference voltage through one of a wirebond, a conductive adhesive, and a welded connection.

33. The integrated circuit package of claim 26, wherein the heat sink is positioned only partially within the package body.

34. The integrated circuit package of claim 26, wherein the heat sink is coupled to a printed circuit board outside the package body and is thereby coupled to one of a signal voltage and a reference voltage so the heat sink operates respectively as a signal plane and a ground plane for the plurality of leads of the lead frame.

35. The integrated circuit package of claim 34, wherein the second portion of the heat sink projects substantially to one of a top and a bottom of the package body.

36. The integrated circuit package of claim 26, wherein the heat sink is positioned within the package body with the surface of its first portion in close proximity to substantially all of the enclosed portion of each of the plurality of leads of the lead frame.

37. The integrated circuit package of claim 26, wherein the heat sink is positioned within the package body with its first portion extending substantially to at least one side of the package body.

39. The integrated circuit package of claim 25, wherein the first and second portions of the heat sink are integral with one another.

40. The integrated circuit package of claim 25, wherein the first and second portions of the heat sink comprise separate parts.

41. The integrated circuit package of claim 25, wherein the heat sink comprises a plurality of parts, each forming a portion of both the first and second portions of the heat sink.

42. The integrated circuit package of claim 25, wherein the surface of the first portion of the heat sink includes a recess in which the die-attach area is located.

43. The integrated circuit package of claim 25, wherein the heat sink has locking holes therein for locking the heat sink in the integrated circuit package.

44. The integrated circuit package of claim 25, further comprising an adhesive attaching the lead frame to the heat sink.

45. The integrated circuit package of claim 25, wherein the integrated circuit package comprises one of a Vertical Surface-Mount Package, a Small-Outline-J-lead-package, a Thin Small Outline Package, a Quad Flat Pack, and a Thin Quad Flat Pack.